HATCHERY EVALUATION REPORT

Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

September 1996

Integrated Hatchery Operations Team (IHOT)

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Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

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Project Number 95-2
Contract Number 95AC49468

September 1996

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Section 1

Executive Summary

This report presents the findings of the independent audit of the Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock) program. The hatchery is located on the Columbia River near Irrigon in northeastern Oregon. The hatchery is used for egg incubation and rearing of summer steelhead stocks from the Imnaha and Grande Ronde River basins.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995).* That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock) Results

The Irrigon facility includes 32 concrete raceways, 68 circular starting tanks, and incubation facilities. The hatchery water supply consists of five wells supplying 19,000 gpm. The hatchery began operation in 1984 as part of the Lower Snake River Compensation Program, (LSRCP) a program to mitigate for spring chinook and summer steelhead losses caused by the four federal dams constructed on the lower Snake River.

The Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock) program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not meet its production and percent survival (smolt to adult) goal in 1 of the 3 years evaluated as a result of low egg take. In the area of facility requirements, the audit found that the hatchery was not in compliance with the IHOT criteria for water quality in the areas of chemistry, alkalinity and hardness, nitrite, and contaminants due to a lack of analyses for these parameters. The hatchery also did not have double screening for the rearing raceways and did not follow IHOT recommendations for the frequency of monitoring alarms. In the area of hatchery practices, the audit found that the hatchery needed to develop written criteria and standards for incubation and rearing practices, written criteria for percent smoltification, did not rear the fish in the subbasin, and did not follow IHOT protocols for disinfection of the exterior and cab of the fish transport vehicles. In the area of genetics policy, the audit found that the hatchery did not have a Genetics Monitoring and Evaluation Program in place.

The specific areas in which the Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock) program **r**equires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Adopt IHOT procedures for transport vehicle exterior and cab disinfection
- Develop a genetics M&E program in line with IHOT policies and procedures
- Develop loading and flow criteria for 4-stack incubators
- Develop written rearing standards and practices
- Develop written smoltification criteria
- Implement IHOT monitoring schedule for alarm system checks
- Provide rearing in the Grande Ronde subbasin
- Provide second set of screens on rearing raceways
- Run analysis for alkalinity and hardness
- Run analysis for chemistry parameters
- Run analysis for contaminants
- Run analysis for nitrite

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Section 2

Facility Description

Name: Irrigon Hatchery

Stock/Species: Summer Steelhead (Grande Ronde Stock)

Operating Agency: Oregon Department of Fish and Wildlife

Funding Agency: Lower Snake River Compensation Program

Location: Near Irrigon, OR on the Columbia River

Address:
Irrigon Hatchery
Route 2, Box 149
Irrigon, OR 97844

Hatchery Manager: Mr. Mike Gribble

Phone: (541) 922-5732
Fax: (541) 922-2609

Purpose: Irrigon Hatchery serves as an egg incubation and rearing facility for summer steelhead destined for the Grande Ronde and Imnaha River systems. Irrigon is also used as a final rearing site for legal-sized rainbow trout destined for northeast Oregon waters.

Production Goal:

Summer Steelhead (Grande Ronde stock)

Produce 1,350,000 smolts (270,000 pounds)

Summer Steelhead (Imnaha stock)

Produce 330,000 smolts (66,000 pounds)

Water Supply: Five wells supplying approximately 19,000 gpm

Facilities:

Adult Holding:	N/A
Incubation:	10 12-tray vertical incubators (120 trays)
	14 3x4-tray vertical incubators (168 trays)
Early Rearing:	68 6-foot diameter, circular fiberglass tanks (530 cf each)
Raceways:	32 20x100 ft concrete raceways (57,350 gal each)
Rearing Ponds:	N/A
Satellite Facilities:	N/A

Section 3

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in ***Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*** (referred to as *IHOT 1995* in this report).[1] The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit.

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[1]Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

This process consisted of research and onsite visits. The site visit at the Irrigon Hatchery was conducted on September 16, 1996.

The following is the five-step audit process:

1. Information was obtained from headquarters.

2. The hatchery manager was asked to fill out and return the **Audit Form**.

3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.

4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report.** That Compliance Report is Table 2 of this document.

5. This information was used to prepare a draft **Hatchery Evaluation Report.** This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

The following includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✔) indicates that the specific life stage is held at this facility.

This section documents the compliance status of the Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock) program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Wallowa Hatchery	Irrigon Hatchery	Big Canyon Acclimation Facility			
Adult Collection	✔					
Adult Holding	✔					
Spawning	✔					
Fertilization	✔					
Incubation						
green-to-eyed	✔					
eyed-to-hatch		✔				
Rearing						
fry		✔				
fingerlings		✔				
smolts	✔	✔	✔			
Acclimation/release	✔		✔			

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin nagement plan?		✔			Columbia Basin System Planning Production Plan and LSRCP Annual Operation Plan	
ıe hatchery operating under a current hatchery rational plan?		✔			IHOT Operations Plan and and LSRCP Annual Operation Plan	
s it understood by staff?		✔				
s it being followed?		✔				
hatchery monitoring and evaluation plan in place?						
Do you have a written monitoring and evaluation plan?		✔				
ılt contribution to fisheries, spawning grounds, and chery		✔			Review of Missing Production Groups Annual Report for 1995	
ılt pre-spawning survival as compared with blished goal	✔				No adults held on station	
-take as compared with established hatchery goal	✔				No egg take on station	
en-egg to eyed-egg survival as compared with blished goal	✔				Receive eyed eggs from Wallowa Hatchery	
d-egg to fry survival as compared with established l		✔			Review of records; in compliance 3 out of last 3 years	
to smolt survival as compared with established goal		✔			Review of records; in compliance 3 out of last 3 years	
duction as compared with established goal				✔	Review of records; in compliance 2 out of last 3 years. Low egg take	Improve ocean survival. Increase adult returns. Increase egg take to goal

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
cent survival (smolt to adult) as compared with blished goal				✔	Review of records; in compliance 2 out of last 3 years.	Improve ocean survival and increase adult returns to goal
nber of eggs, fry, fingerlings, smolts, and/or adults neet basinwide needs	✔				Review of records/Discussion. Not a compliance measure	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nperature						
Does your water temperature meet the criteria for spawning?	✔				No adults held on station	
Does your water temperature meet the criteria for ncubation?				✔	Review of records/Discussion	None. Modify temperatures to meet program requirements
Does your water temperature meet the criteria for earing?				✔	Review of records/Discussion	None. Average is ok. Provide greater flow when outside criteria
solved gases						
s the oxygen level near saturation?		✔			Review of records/Discussion	
s the dissolved nitrogen level less than saturation?		✔			Review of records/Discussion	
emistry						
mmonia (un-ionized)			✔		No data	Run the analysis
Carbon Dioxide			✔		No data	Run the analysis
Chlorine			✔		No data	Run the analysis
H			✔		No data	Run the analysis
Copper			✔		No data	Run the analysis
lydrogen Sulfide			✔		No data	Run the analysis
ron			✔		No data	Run the analysis
inc			✔		No data	Run the analysis
bidity						
Does your turbidity meet the criteria?		✔			Well water with no visible turbidity	
alinity and hardness						
Does your alkalinity and hardness meet the criteria?			✔		No data	Run the analysis
rite						
Does your nitrite meet the criteria?			✔		No data	Run the analysis

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Contaminants						
Aldrin			✔		No data	Run the analysis
Endrin			✔		No data	Run the analysis
Dieldrin			✔		No data	Run the analysis
Heptachlor			✔		No data	Run the analysis
Chlordane			✔		No data	Run the analysis
Methoxychlor			✔		No data	Run the analysis
Lindane			✔		No data	Run the analysis
Malathion			✔		No data	Run the analysis
Guthion			✔		No data	Run the analysis
Pathogens						
What portions of the hatchery have disease-free water?						
Adult holding	✔				No adults on station	
Incubation		✔			Inspection of facilities/ Discussion	
Early rearing		✔			Inspection of facilities/ Discussion	
Rearing		✔			Inspection of facilities/ Discussion	
Others		✔			Inspection of facilities/ Discussion	Truck fill station
Alarm Systems						
Do the following areas have alarms?						
Intake		✔			Inspection of facilities/ Discussion	
Large rearing ponds and adult holding ponds		✔			Inspection of facilities/ Discussion	
Raceway headboxes and rearing ponds		✔			Inspection of facilities/ Discussion	
Incubation facilities		✔			Inspection of facilities/ Discussion	
Quarantine areas and facilities	✔				None	
Water treatment systems	✔				None	
Security				✔	Onsite staff conduct security checks; no automated systems	None. Not a problem

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıre there outside systems and buzzers in on-site esidences?		✔			Discussion	
ıre water flow alarms checked daily?				✔	Review of records/Discussion	Adopt IHOT recommendations for frequency of checking alarms
ıre all other alarms checked weekly?				✔	Discussion	Adopt IHOT recommendations for frequency of checking alarms
s there a log of alarms for emergencies, tests, and ıaintenance requirements?				✔	Review of records/Discussion	Adopt IHOT recommendations for frequency of checking alarms
ıre telephone pagers used?				✔	Residences are hard-wired to alarm systems	None. Not a problem
ılt collection and holding facilities						
)o you meet the adult holding criteria?	✔				No adults on station	
ıbation facilities						
'ype 1: _Vertical__)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
'ype 2: _____)o you have an adequate number of units for the verall program?						
ıring facilities						
'ype 1: _Circular fibergalss tanks__)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
'ype 2: __Concrete raceways_____)o you have an adequate number of units for the verall program?		✔			Inspection of facilities. Water supply is limiting factor; new oxygen system to be installed	
'ype 3: _____)o you have an adequate number of units for the verall program?						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
eening facilities						
)o you meet the approach velocity criteria?	✔				Well water supply, screens not needed	
ıre the fish screens regularly cleaned?	✔				see above	
)oes the screen mesh meet screen opening criteria?	✔				see above	
ıre rearing containers double screened for fish that hould not be released to adjacent water?				✔	Inspection of facilities/Discussion	Retrofit raceways for a second set of screens
dator control facilities						
ıre your predation control facilities effective?		✔			Inspection of facilities/Discussion	
d storage facilities and quality control						
)oes the storage of dry/semi-moist/moist foods dry<12%; semi-moist 12-20%; moist >20% moisture) ollow food manufacturer's recommendations?		✔			Inspection of facilities/Discussion	
)oes a regional quality control officer oversee roduction procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✔	Discussion	Adopt IHOT recommendations for monitoring food production
Ensure feed does not contain unwanted drugs or other additives?				✔	Discussion	Adopt IHOT recommendations for monitoring food production
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✔	Discussion	Adopt IHOT recommendations for monitoring food production
ıre the foods stored and handled according to the ollowing criteria?						
Moist pellets should not exceed 10 °F at point of delivery.		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Moist pellets should be removed from freezer just prior to feeding.		✔			Discussion	
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✔			Discussion	
Open bags of feed should be fed within one to two days except when feeding small groups of fish.		✔			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).				✔	Interiors can exceed 80 °F on hot days; no specific problems experienced	None
ease facilities						
)o the release facilities ensure that fish are not ubjected to adverse conditions?	✔				Inspection of facilities/Discussion. All fish trucked off station.	
lution abatement facilities						
)o the pollution abatement facilities meet all federal nd state regulations (or good engineering practice)?		✔			Inspection of facilities/Discussion	
ıre pollution abatement facilities operated correctly?		✔			Discussion	
nsportation facilities						
ıre the transport systems adequate to meet IHOT erformance measures for transportation practices?		✔			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
odstock selection practices						
s the donor selection process document attached?	✔				Existing program; does not apply	
Was the donor selection outline followed in selecting ne hatchery broodstock?	✔				Existing program; does not apply	
to PM #40 in Genetics Section						
wning practices						
Were the appropriate number of spawners, male/female atios, and fertilization protocols used?		✔			Review of records/Discussion. Spawning occurs at Wallowa Hatchery	
to PM #42 in Genetics Section						
ıbation practices						
specific incubation standards listed in the hatchery rations plan?				✔	Reviewed IHOT Operations Plan and Lower Snake River Program AOP; no written standards	Develop written standards
incubation practices written?				✔	No written practices	Develop written practices
ıbation Type 1: vertical (see PM #8) you meet the loading and flow criteria?			✔		Use 4-tray stack, no IHOT criteria for this unit	Develop criteria for the 4-tray stack
ıbation Type 2:_____ (see PM #8) you meet the loading and flow criteria?						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ring practices						
specific rearing standards listed in the hatchery rations plan?				✔	Reviewed IHOT Operations Plan and Lower Snake River Program AOP; no written standards	Develop written standards
rearing practices written?				✔	No written practices	Develop written practices
earing Unit Type 1: circular tanks (see PM #9)						
Do you meet the density and DI criteria?		✔			Meet density criteria; do not use DI criteria as a standard	
Do you meet the Loading and FI criteria?		✔			Meet the loading criteria; do not use FI criteria as a standard	
earing Unit Type 2: raceways (see PM #9)						
Do you meet the density and DI criteria?		✔			Meet density criteria; do not use DI criteria as a standard	
Do you meet the Loading and FI criteria?		✔			Meet the loading criteria; do not use FI criteria as a standard	
earing Unit Type 3: ___ (see PM #9)						
Do you meet the density and DI criteria?						
Do you meet the Loading and FI criteria?						
olt quality						
Do you produce a high quality smolt?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
h health management practices						
re the monthly hatchery monitoring visits being onducted? (PM #26)		✔			Review of records/Discussion	
re the annual broodstock inspections being conducted? PM #27)		✔			Review of records/Discussion	
there pathogen-free water and are the sanitation rocedures being followed? (PM #28)		✔			Review of records/Discussion	
re the following water quality parameters within riteria? (PM #5a-5h)						
Water temperature				✔	Review of records/Discussion	None
Dissolved gases		✔			Review of records/Discussion	
Chemistry			✔		No data	Run analysis
Turbidity		✔			Well water; no turbidity problems	
Alkalinity and hardness			✔		No data	Run analysis
Nitrite			✔		No data	Run analysis
Contaminants			✔		No data	Run analysis
re rearing standards being followed? (PM #19)				✔	No written standards	Develop written standards
re egg and fish transfer/release requirements met? PM #31)		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s hatchery performance meet requirements lined in the regional hatchery policies and in basin and hatchery plans for the following areas?						
cent smoltification						
Do you measure percent smoltification?		✔			Discussion	
Did you meet the smoltification criteria?				✔	No established index or goal for smoltification	Develop written criteria for smoltification
ring density (prior to release)						
Did you meet the rearing density criteria just prior to elease?		✔			Review of records/Discussion	
ease condition (at release)						
Did you meet all disease regulations just prior to elease?		✔			Review of records/Discussion	
nber (at release)						
Did you meet the release number goal?		✔			Review of records/Discussion	
at release						
Did you meet the size goal?		✔			Review of records/Discussion	
es of release						
Did you meet the release date goal?		✔			Review of records/Discussion	
ation of release						
Did you release the fish at the specified location?		✔			Review of records/Discussion	
fish reared in the subbasin or acclimated in the basin?						
are the fish reared in the subbasin?				✔	Not reared in the subbasin	Provide rearing in the subbasin
are the fish acclimated in the subbasin?		✔			Discussion	
ne release strategy appropriate for the program?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)o transportation equipment and personnel receive isinfection before and after use?		✔			Discussion	
; the fish tank interior disinfected using a solution of 00 ppm active chlorine for 30 minutes minimum or ɔrmaldehyde gas generation method (relative humidity f 60% for 2 hrs)?		✔			Discussion	
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?				✔	Discussion	Adopt IHOT procedures for transport vehicle disinfection
; the fish transport vehicle (cab) disinfected using 600 pm quaternary ammonia compounds (1.5 ml of 50% tock solution/liter water)?				✔	Discussion	Adopt IHOT procedures for transport vehicle disinfection
; other equipment disinfected including fish pumps, ets, egg sorters, waders, boots, rain gear, hoses and ther equipment using one of the following solutions?		✔			Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✔			Discussion	
)o personnel wear protective garments when handling sh eggs or cultural water?		✔			Discussion	
)o the fish transport truck/chassis and tank/unit receive n inspection and service prior to the release season?		✔			Discussion	
; a daily service inspection completed before starting p and leaving for the day?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)oes the fish transport unit receive an inspection prior) loading?		✔			Discussion	
)oes a pre-loading inspection covering: tank water evel, pumps or aerators, oxygen injection system ettings, displacement gauge, and truck loading/hauling ensity tables checked and reviewed occur prior to)ading fish in the transport unit?		✔			Discussion	
)o hauling criteria include checking the fish 45 minutes) 1 hour after loading ?		✔			Discussion	
Vhen fish are active and systems are functioning roperly, is the oxygen concentration reduced and ıaintained at approximately 8 ppm?		✔			Discussion	
; water temperature in the transportation unit ıaintained within the 42-48 °F range?		✔			Discussion	
)o fish releasing procedures include the following riteria?						
Releasing the fish at the correct release site or into the correct water body.		✔			Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✔			Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
luation practices						
las the hatchery conducted fishery contribution studies):						
Determine the requirements for evaluating and improving management programs?		✔			Discussion	
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✔			Discussion	
Develop guidelines that define if the proper stocks of fish are currently being used?		✔			Discussion	
Determine which management units contribute to a specific fishery and the time periods of those contributions?		✔			Discussion	
Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?		✔			Review of records/Discussion	
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✔			Review of records/Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✔			Review of records/Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✔			Review of records/Discussion	
Does the hatchery conduct monthly staff meetings?		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
monthly hatchery monitoring visits being ducted by a qualified fish health specialist as cribed below?						
Conduct visit at least monthly		✔			Review of records/Discussion	
Monitoring conducted by qualified fish health specialist		✔			Review of records/Discussion	
Examine a representative sample of healthy and moribund fish from each lot.		✔			Review of records/Discussion	
Review fish culture practices with hatchery manager.		✔			Review of records/Discussion	
Report finding and results of necropsies on standard form.		✔			Review of records/Discussion	
Recommend appropriate drug or chemical treatment.		✔			Review of records/Discussion	
Summarize fish health status or stock prior to release or transfer to another facility.		✔			Review of records/Discussion	
all of the functions of the hatchery yearly nitoring visits being completed as described below?						
Annually examine each broodstock for the presence of reportable viral pathogens.	✔				At Wallowa	
Annually screen each salmon broodstock for the resence of *Renibacterium salmoninarum*.	✔				See above	
Conduct inspection by or under the supervision of ualified fish health specialist.	✔				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıe hatchery following accepted sanitation cedures?						
ıre there any sources of pathogen-free water, especially or incubation and early rearing?		✔			Discussion	
ıre the hatchery sanitation procedures understood and eing followed as described below?						
Disinfect/water harden eggs in iodophor?		✔			Inspection of facilities/ Discussion	
Are footbaths containing disinfectant placed at the incubation facility's entrance and exit?				✔	Inspection of facilities/ Discussion	Provide footbaths
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?	✔				No broodstock handling on station	
Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?		✔			Inspection of facilities/ Discussion	
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✔			Inspection of facilities/ Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?		✔			Inspection of facilities/ Discussion	
Are dead fish properly disposed of?		✔			Inspection of facilities/ Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
re the following water quality parameters within riteria? (PM #5a-5h)						
Water temperature				✔	Review of records/Discussion	None
Dissolved gases		✔			Review of records/Discussion	
Chemistry			✔		No data	Run analysis
Turbidity		✔			Well water; no turbidity problems	
Alkalinity and hardness			✔		No data	Run analysis
Nitrite			✔		No data	Run analysis
Contaminants			✔		No data	Run analysis
o to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)				✔	No written incubation practices	Develop written incubation practices
Are the rearing practices following the IHOT criteria? (PM #19)				✔	No written rearing practices	Develop written rearing practices
o to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
he hatchery's program outlined in a subbasin nagement plan? o to subbasin plan PM #1		✔			Columbia Basin System Planning Production Plan and Lower Snake River Program AOP	
he hatchery operating under a current hatchery rational plan? o to operational plan PM #2		✔			Review IHOT Operations Plan and Lower Snake River Program AOP	
hatchery monitoring and evaluation plan in place? o to hatchery monitoring and evaluation plan PM #3		✔			M&E program described in and Lower Snake River Program AOP	
s the hatchery program meet requirements blished in the regional hatchery policies and basin planning documents in the following areas: cies, stock, broodstock collection location, odstock numbers, broodstock collection strategy, spawning and egg-take protocols? oes the hatchery program meet the requirements for he following?						
Species protocols (PM #4a)		✔			Review of records/Discussion	
Stock protocols (PM #4a)		✔			Review of records/Discussion	
Broodstock collection location protocols (PM #41)	✔				Does not occur at Irrigon	
Broodstock numbers protocols (PM #42)	✔				Does not occur at Irrigon	
Broodstock collection strategy protocols (PM #41)	✔				Does not occur at Irrigon	
Spawning protocols (PM #42)	✔				Does not occur at Irrigon	
Egg-take protocols (PM #42)	✔				Does not occur at Irrigon	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery's performance meet requirements						
ined in the regional hatchery policies and in basin and hatchery plans for the following areas: cent smoltification, rearing density, disease						
dition, and the number, size date(s), and location of ase?						
ercent smoltification (PM #22a1)				✔	Review of records/Discussion	Develop written percent smoltification criteria
earing density (PM #22a2)		✔			Review of records/Discussion	
)isease condition (PM #22a3)		✔			Review of records/Discussion	
Number at release (PM #22a4)		✔			Review of records/Discussion	
ize at release (PM #22a5)		✔			Review of records/Discussion	
)ate of release (PM #22a6)		✔			Review of records/Discussion	
ocation of release (PM #22a7)		✔			Review of records/Discussion	
fish reared in the subbasin or acclimated in the basin? PM #22b		✔			Fish are not reared in the subbasin; fish are acclimated in the subbasin	
ne release strategy appropriate for the program? PM #22c		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
new programs, has a broodstock collection plan n developed?						
s the broodstock collection plan written?	✔				Existing Program; does not apply	
or a non-captive broodstock program:	✔				Existing Program; does not apply	
Was an unbiased, representative sample collected?						
Was the recommended number of broodstock collected?	✔				Existing Program; does not apply	
or a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✔				Existing Program; does not apply	
Were full-sib crosses avoided?	✔				Existing Program; does not apply	
s the broodstock collection plan understood and being ollowed by staff?	✔				Existing Program; does not apply	
a new program, was the donor selection outline owed in selecting the hatchery broodstock?						
s a donor selection plan written?	✔				Existing Program; does not apply	
Was the donor selection outline followed in selecting ne broodstock?	✔				Existing Program; does not apply	
Was the target stock recommended in the donor election process actually used?	✔				Existing Program; does not apply	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
s the broodstock collection plan written?	✔				At Wallowa	
Does the broodstock collection plan follow the uideline:						
Was an unbiased, representative sample collected?	✔				See above	
Was the recommended number of broodstock collected?	✔				See above	
Were the broodstock collection procedures in hatchery operation plan understood and followed?	✔				See above	
Were the broodstock collection procedures in hatchery operation plan understood and followed?	✔				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the appropriate number of spawners, male/female os, and fertilization protocols used?						
ıre the spawning protocols written?	✔				Not at Irrigon; occurs at Wallowa Hatchery	
ıre daily or weekly spawning logs available?	✔				Not at Irrigon; occurs at Wallowa Hatchery	
Vas the appropriate number of spawners used?	✔				Not at Irrigon; occurs at Wallowa Hatchery	
)id you attempt to spawn all collected broodstock and ındomize mating with respect to age class, and other ·aits?	✔				Not at Irrigon; occurs at Wallowa Hatchery	
Vas the sex-ratio within the limits given in the erformance standards?	✔				Not at Irrigon; occurs at Wallowa Hatchery	
Vere the fertilization protocols followed?	✔				Not at Irrigon; occurs at Wallowa Hatchery	
: the hatchery needed to reduce the number of eggs etained, was this done by representative sampling of ach male/female cross?		✔			Discussion/ If needed this is coordinated among Wallowa and Irrigon hatcheries and ODF&W Research Division	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıere a genetics monitoring and evaluation program lace?						
s a genetics monitoring and evaluation program vailable?				✔	No written program	Develop a genetics M&E program for IHOT
oes the plan address the following elements listed in HOT:						
Does the program have elements needed to meet evaluation goals 1-4?				✔	No written program	Develop a genetics M&E program for IHOT
Has a qualified geneticist reviewed and endorsed the program (goal 5)?				✔	No written program	Develop a genetics M&E program for IHOT
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?				✔	No written program	Develop a genetics M&E program for IHOT
Is the program understood and followed by staff?				✔	No written program	Develop a genetics M&E program for IHOT

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

Remedial Actions at Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

This section presents the corrective actions required to bring the Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock) program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates (± 40%).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3. Remedial Actions Required at Irrigon Hatchery: Summer Steelhead (Grande Ronde Stock)

Remedial Action Required	Cost	PMs[1]
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Improve ocean survival to increase adult returns and subsequent egg take to meet goals	----	4g, 4h
Provide electronic security alarms; however, not a problem for this hatchery because onsite staff conduct security checks	----	6
Provide telephone pagers; however, not a problem for this hatchery because residences are hard-wired to alarm system	----	6
Insulate feeders against excessive temperatures; however, no problems experienced	----	12
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Implement IHOT monitoring schedule for alarm system checks	----	6
Develop loading and flow criteria for 4-stack incubators	----	18, 30
Develop written rearing standards and practices	----	19, 21, 31
Develop written smoltification criteria	----	22a1, 36
Adopt IHOT procedures for transport vehicle disinfection	----	23
Develop a genetics M&E program in line with IHOT policies and procedures	----	43

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Remedial Action Required	Cost	PMs[1]
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Run analysis for chemistry parameters	----	5c, 21, 29
Run analysis for alkalinity and hardness	----	5e, 21, 29
Run analysis for nitrite	----	5f, 21, 29
Run analysis for contaminants	----	5g, 21, 29
Type 4 - Remedial actions requiring significant capital expenditures		
Provide second set of screens on rearing raceways	$30,000	10
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Provide rearing in the Grande Ronde subbasin	----	22b

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Section 5

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock) contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

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Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries: Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

Year	Fisheries[1] (Broodyear)	Spawning Grounds[1] (Broodyear)	Hatchery[1] (Broodyear)	Total Combined Contribution[2] (Broodyear)	Smolt to Adult Survival (percent)
1981					
1982					
1983					
1984					
1985					
1986				4654	0.79
1987				2716	0.52
1988				1156	0.21
1989				2888	0.96
1990				2483	1.05
1991					
1992					

[1] Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

[2] Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

Section 6

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program were estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock) program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Tables 5a and 5b).

Table 5. Annual Operating Expenses: Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

Hatchery	1994	1995	1996
1. Irrigon	$629,778	$639,873	$623,797
2. Wallowa	$169,000	$176,206	$187,643
3.			
4.			
5.			
Total Program Costs	**$798,778**	**$816,079**	**$811,440**

The total expenditures for the Irrigon Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery is presented in separate tables (Tables 6a, 6b and 6c).

Table 6. Annual Operating Expenses - Irrigon Hatchery

Program	1994	1995	1996
1. Summer Steelhead (Grande Ronde Stock)	$629,778	$639,873	$623,797
2. Summer Steelhead (Imnaha Stock)	$163,977	$151,032	$134,589
3. Rainbow Trout (State Funds)	$9,436	$8,454	$8,466
4.			
5.			
Total Hatchery Costs	**$803,191**	**$799,360**	**$766,852**

Table 5a. Annual Operating Expenses: Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

Expenditure Occurring at Irrigon Hatchery

Component	1994	1995	1996
Personnel Costs	$336,767	$321,319	$298,461
Operational Costs	$323,942	$353,078	$353,711
Capital Costs	$21,058	$0	$0
Indirect Costs	$121,424	$124,963	$114,680
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	$0	$0	$0
Total Hatchery Costs	**$803,191**	**$799,360**	**$766,852**
Source of Funds			
LSRCP - 100%			
Program Production (lb)	247,484	254,073	257,433
Total Production (lb)	315,630	317,400	316,470
Program as Percent of Total	78.4	80.0	81.3
Program Costs	**$629,778**	**$639,873**	**623,797**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 5b. Annual Operating Expenses: Irrigon Hatchery - Summer Steelhead (Grande Ronde Stock)

Expenditure Occurring at Wallowa Hatchery

Component	1994	1995	1996
Personnel Costs	$103,082	$107,313	$121,879
Operational Costs	$61,469	$64,275	$75,634
Capital Costs	$24,518	$8,173	0
Indirect Costs	$33,831	$35,124	$40,010
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	0	0	0
Total Hatchery Costs	**$222,900**	**$214,885**	**$237,523**
Source of Funds			
100% LSRCP			
Program Production (#)	812,000	1,037,000	1,029,000
Total Production (#)	1,0650,000	1,268,000	1,298,000
Program as Percent of Total	76%	82%	79%
Program Costs	**$169,000**	**$176,206**	**$187,643**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6a. Detailed Expenditures at Irrigon Hatchery by Program

Summer Steelhead (Grande Ronde Stock)

Component	1993	1994	1995
Personnel Costs	$336,767	$321,319	$298,461
Operational Costs	$323,942	$353,078	$353,711
Capital Costs	$21,058	$0	$0
Indirect Costs	$121,424	$124,963	$114,680
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	$0	$0	$0
Total Hatchery Costs	**$803,191**	**$799,360**	**$766,852**
Source of Funds			
Program Production (lb)	247,484	254,073	257,433
Total Production (lb)	315,630	317,400	316,470
Program as Percent of Total	78.4	80.0	81.3
Program Costs	**$629,778**	**$639,873**	**623,797**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6b. Detailed Expenditures at Irrigon Hatchery by Program

Summer Steelhead (Imnaha stock)

Component	1994	1995	1996
Personnel Costs	$336,767	$321,319	$298,461
Operational Costs	$323,942	$353,078	$353,711
Capital Costs	$21,058	$0	$0
Indirect Costs	$121,424	$124,963	$114,680
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	$0	$0	$0
Total Hatchery Costs	**$803,191**	**$799,360**	**$766,852**
Source of Funds			
LSRCP (100%)			
Program Production (lb)	64,438	59,970	55,543
Total Production (lb)	315,630	317,400	316,470
Program as Percent of Total	20.4	18.9	17.6
Program Costs	**$163,977**	**$151,032**	**$134,589**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6c. Detailed Expenditures at Irrigon Hatchery by Program

Rainbow Trout

Component	1994	1995	1996
Personnel Costs	$336,767	$321,319	$298,461
Operational Costs	$323,942	$353,078	$353,711
Capital Costs	$21,058	$0	$0
Indirect Costs	$121,424	$124,963	$114,680
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	$0	$0	$0
Total Hatchery Costs	**$803,191**	**$799,360**	**$766,852**
Source of Funds			
State Funds (100%)			
Program Production (lb)	3,708	3,357	3,494
Total Production (lb)	315,630	317,400	316,470
Program as Percent of Total	1.2	1.1	1.1
Program Costs	**$9,436**	**$8,454**	**$8,466**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.